WHAT IS CLAIMED IS:

1. A method of manufacturing a flowing junction reference electrode, the method comprising:

providing a chamber for receiving a reference electrolyte solution, wherein the chamber is configured to allow pressurization of the electrolyte solution; and

providing a liquid junction member having N discrete nanochannels, the nanochannels having diameters D and lengths L, wherein N is less than approximately 100,000, and wherein the member is in fluid communication with the electrolyte solution.

2. The method of Claim 1, further comprising filling said chamber with a reference electrolyte solution having a viscosity η and pressurizing the electrolyte solution to a pressure P_E.

3. The method of Claim 2, wherein the electrolyte solution comprises a surfactant.

4. The method of Claim 2, further comprising configuring the reference electrode such that the liquid junction member can be brought into fluid communication with a sample solution such that the junction member is situated between the electrolyte solution and the sample solution.

5. The method of Claim 4, further comprising selecting ΔP, D, η, and L such that $\frac{D^2 \Delta P}{32\eta L}$ is greater than about 0.1 centimeter per second, wherein ΔP is a pressure differential between P_E and a pressure P_S of the sample solution.

6. The method of Claim 5, wherein ΔP is greater than approximately 10 psi and less than approximately 100 psi.

7. The method of Claim 5, wherein ΔP is less than approximately 70 psi.

8. The method of Claim 1, wherein N is less than approximately 50,000.

9. The method of Claim 1, wherein N is less than approximately 10,000.

10. The method of Claim 1, wherein N is less than approximately 1,000.

11. The method of Claim 1, wherein N is greater than approximately 10.

12. The method of Claim 1, wherein N is greater than approximately 100.

13. The method of Claim 1, wherein a diameter D_i of any one nanochannel is substantially equal to a diameter D_j of any other nanochannel.

14. The method of Claim 1, wherein D is greater than approximately 1 nanometer and less than approximately 900 nanometers.

15. The method of Claim 1, wherein D is greater than approximately 5 nanometers and less than approximately 750 nanometers.

16. The method of Claim 1, wherein D is greater than approximately 10 nanometers and less than approximately 500 nanometers.

17. The method of Claim 1, wherein D is greater than approximately 40 nanometers and less than approximately 250 nanometers.

18. The method of Claim 1, wherein L is greater than approximately 0.5 micrometer and less than approximately 500 micrometers.

19. The method of Claim 1, wherein L is greater than approximately 6 micrometers and less than approximately 400 micrometers.

20. The method of Claim 1, wherein L is greater than approximately 500 micrometers.

21. The method of Claim 1, wherein the nanochannels are substantially straight and substantially parallel to one another.

22. The method of Claim 1, wherein the nanochannels are coated.

23. The method of Claim 22, wherein the nanochannels are coated with a material selected from the group consisting of gold, platinum, and palladium.

24. The method of Claim 22, wherein the nanochannels are coated with a hydrophilic material.

25. The method of Claim 22, wherein the nanochannels are coated with a hydrophobic material.

26. The method of Claim 1, wherein the junction member is manufactured as a single planar element.

27. The method of Claim 1, wherein the junction member comprises a rigid support member.

28. The method of Claim 1, wherein the junction member is a laminate comprising at least one multiple planar element.

29. The method of Claim 28, wherein at least one of the multiple planar element is selected from the group consisting of a pressure sensor, a temperature sensor, a flow rate sensor, an electrical resistance sensor, a redox potential sensor, a conductivity sensor, and a pH sensor.

30. The method of Claim 1, wherein the junction member comprises a planar element of microchannels coupled to a planar element of nanochannels.

31. The method of Claim 30, wherein the planar element of microchannels is bonded to the planar element of nanochannels.

32. The method of Claim 30, wherein the planar element of the microchannels is thermally or adhesively bonded to the planar element.

33. The method of Claim 30, wherein the microchannels have widths greater than approximately 5 micrometers and less than approximately 25 micrometers.

34. The method of Claim 1, wherein the junction member is made of a polymer.

35. The method of Claim 34, wherein the polymer is selected from the group consisting of polycarbonate, polyethylene, and polyimide.

36. The method of Claim 1, wherein the junction member is made of silicon, glass, or ceramic.

37. The method of Claim 1, further comprising providing means for pressurizing the electrolyte solution.

38. The method of Claim 37, wherein the means for pressurizing is selected from the group consisting of a pressurized collapsible bladder, an electro-osmotic pump, a mechanical pump, a piezo-electric pump, and a electro-hydrodynamic pump.

39. The method of Claim 38, wherein the mechanical pump comprises a piston-driven pump.

40. The method of Claim 38, wherein the mechanical pump comprises a spring-loaded piston drive.

41. The method of Claim 1, further comprising providing a sensing electrode.

42. The method of Claim 41, wherein the sensing electrode is selected from the group consisting of pH electrodes, other ion-selective electrodes, and redox electrodes.